Space Weather Technical Forecast

Issued on Friday 14 March 2025 at 01:29 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: Isolated M-class flares likely. G1/Minor geomagnetic storms expected today.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low with a peak flare C7.9 at 13/1935 UTC from a region just behind the southeast limb. This is despite the ten numbered regions currently on the Earth-facing disc, including two with delta configurations. The most notable of these is AR4019 in the north-centre disc, with a further delta spot evident on AR4021 in the southeast. The other region of note is AR4028, which is still rotating onto the Earth-facing disc from over the southeast limb.

No Earth-directed CMEs have been observed in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds, as measured by ACE at L1, were predominantly at Elevated levels due to a high speed stream (HSS) connection to CH22/-. Wind speeds generally ranged between 490-550 km/s. Density was mostly below average. Interplanetary Magnetic Field strength, Bt, was Weak at 8nT or below. The north-south component, Bz, Weakly fluctuated, ranging from +/- 8nT. Phi angle was mainly negative (towards the Sun). Geomagnetic activity was Active (Kp 4) to G1/Minor Storm (Kp 5).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES18 was at Background. High energy electron flux (greater than 2 MeV) was initially Background to moderate, then from midday increased Moderate to High recording a max of 1561 pfu at 13/1510 UTC. The 24-hour fluence remained below the Active threshold (1e8 integrated pfu), recording 3.61e7 integrated pfu at 14/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is likely, with isolated M-class flares and a slight chance of X-class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Ongoing fast wind of CH22/-, currently near 550km/s, is expected to gradually ease a little today (14 Mar) but especially through tomorrow (15 Mar), before a further enhancement is possible from a fast wind from CH23/- either late day 3 (16 Mar) or more likely through day 4 (17 Mar). Geomagnetic activity is expected to start at Active to G1/Minor Storm levels then decrease Unsettled to Active today, then

---

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

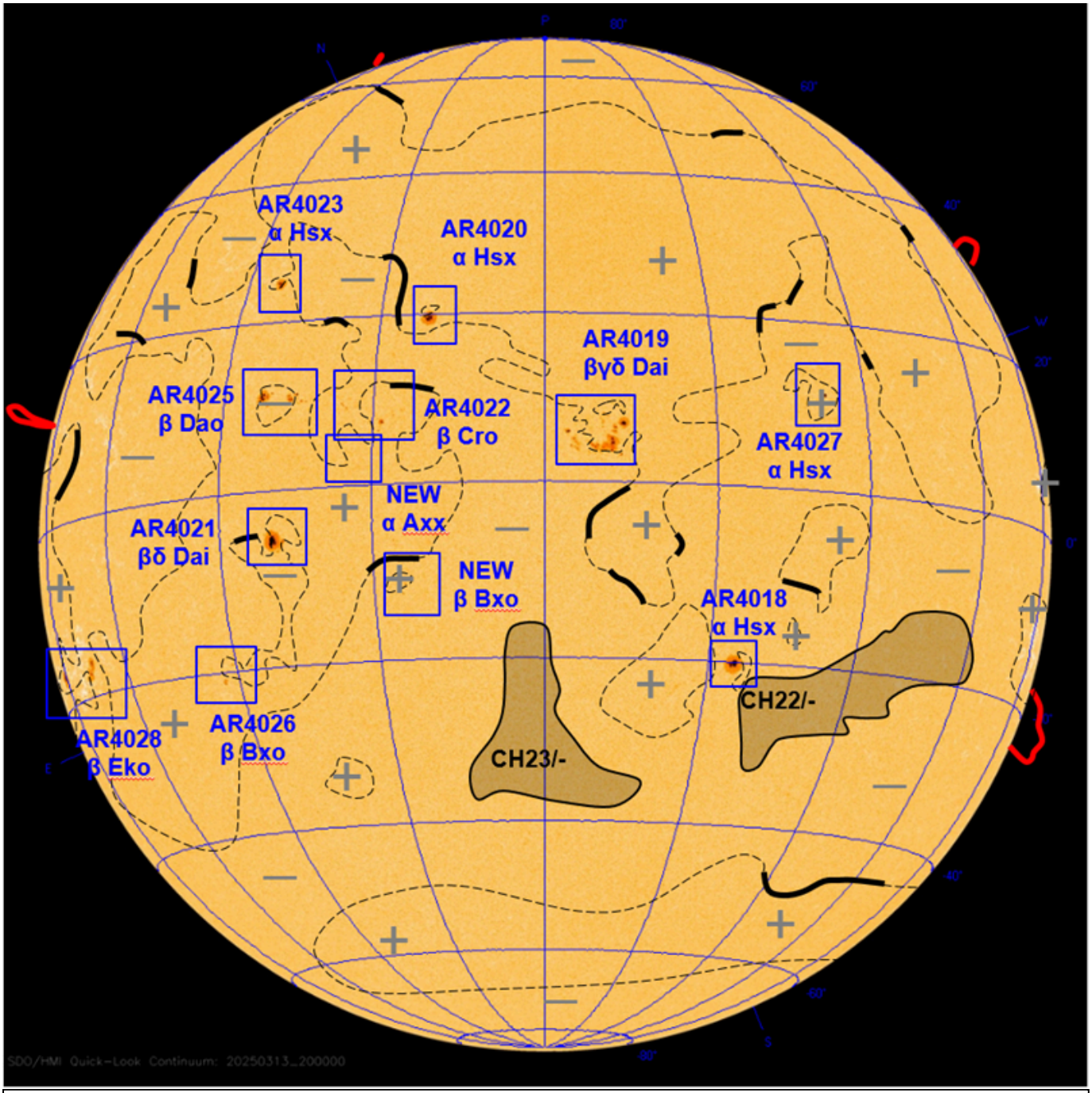
becoming mainly Quiet to Unsettled with isolated Active intervals for days 2 and 3. The arrival of a HSS from CH23/- brings a chance of activity increasing to Active to G1/Minor Storm again.

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain at background. High energy electron flux is expected to reach Moderate to High levels, with an increasing chance of the associated 24 hour fluence becoming Active (greater than 1e8 integrated pfu). Confidence lowers for day 4 (17 Mar), with flux likely to become suppressed by any further fast wind onset, from CH23/-.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Figure 1: Synoptic map valid 13/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Geomagnetic Storms

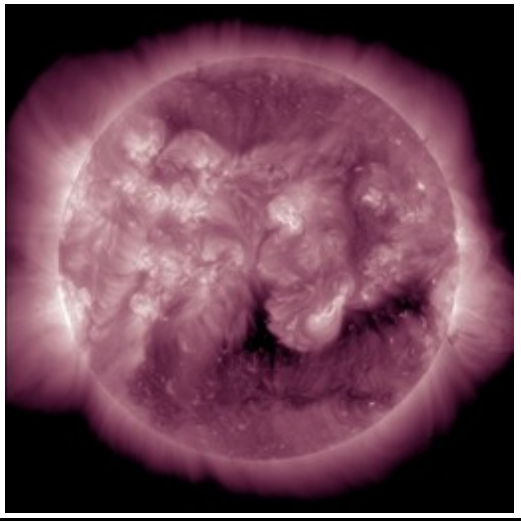
There are no Earth-directed CMEs.

Solar winds are currently Elevated due to the fast wind of CH22/- with speeds around 550 km/s and ongoing periods of southward orientated IMF, which led to Active to G1/Minor Storms activity through the previous 24 hour period. Conditions may gradually ease through day 1 (14 Mar), more likely through days 2 and 3 (15 and 16 Mar) before the next solar wind enhancement probably occurs from CH23/-. This is a more uncertain enhancement, as this feature is both further south, and was also combined with CH22/- to form a single feature on the previous rotation. Any subsequent CIR region is consequently low confidence, but there remains the potential for a solar wind enhancement back to Elevated levels, possibly from late day 3 but more likely during day 4 (17 Mar).

Geomagnetic activity is expected to start at Active to G1/Minor Storm levels then decrease Unsettled to Active today, then becoming mainly Quiet to Unsettled with isolated Active intervals for days 2 and 3. The arrival of a HSS from CH23/- brings a chance of activity increasing to Active to G1/Minor Storm again.

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	30	50	50
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Latest SDO AIA/211 image showing CH22 and CH23.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

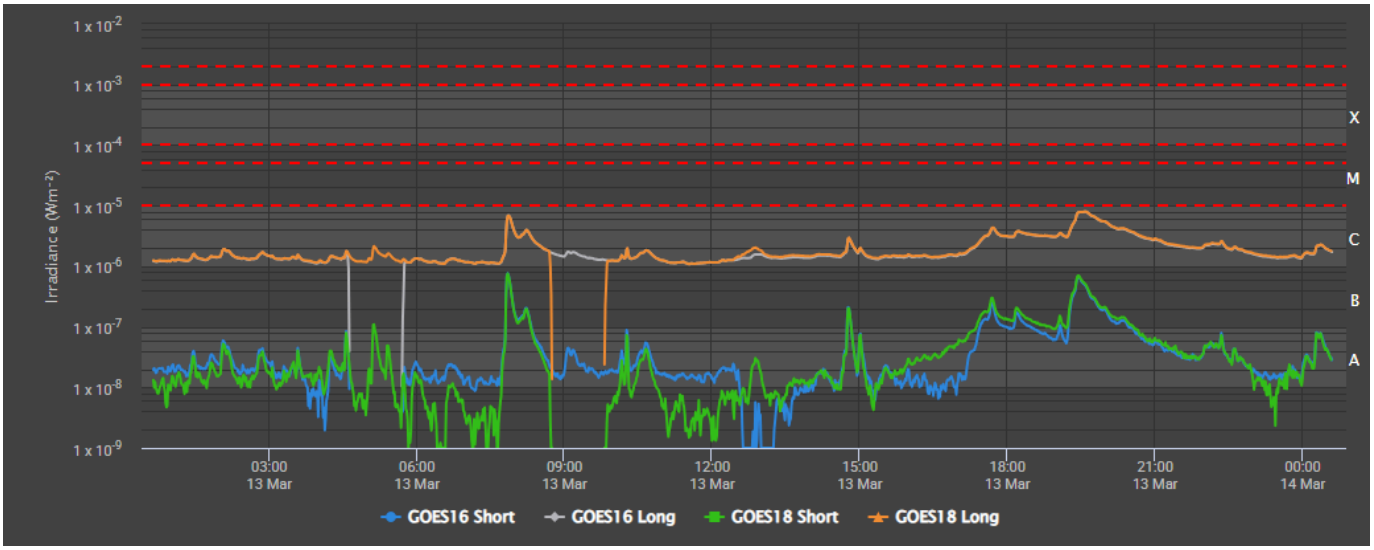
Radio Blackouts - X-Ray Flares

Low to Moderate activity is expected with a likelihood of isolated M-class flares and slight chance of X-class flares.

The main flare risk is a combined risk from AR4019 and AR4028, and also from the far side region approaching the southeast limb. AR4019 is a relatively small region, but with a small but moderately strong delta spot on its southern periphery and a relatively complex magnetic structure. AR4028, which has recently moved onto the disc, also has a flare potential with some complexity likely to become visible as this moves to a less oblique viewing angle, with some notable looping above the disc. The remaining regions on the disc are relatively small and simple regions, with a number of mature unipolar spots. The only exception is AR4021 in the southeast quadrant, due to a very small delta spot on its leading edge.

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	No	50	50	50	50
Very Active	R3-R5 (X Class)	No	5	5	5	5

Figure 3: Past 24 hours X-ray flares



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Solar Radiation Storms (High Energy Protons)

GOES18 high energy (>10MeV) proton flux is expected to remain at background, with only a slight chance of enhancement given any notable flares from the regions currently on the Earth-facing disc. This is perhaps most likely from any notable activity from AR4019 in the north-centre disc.

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

High Energy Electrons (≥ 2MeV)

As the HSS from CH22/- may ease a little today, and more likely through tomorrow (15 Mar) this is likely to allow for an outward expansion of the Van Allen belts, and a subsequent increase in the observed flux at GEO. The high energy electron flux is expected to become Moderate to High through today. Confidence becomes low by day 4 (17 Mar) however, with the potential re-enhancement to the solar wind from the onset of and fast wind from CH23/-. This could lead to flux dropping out towards background.

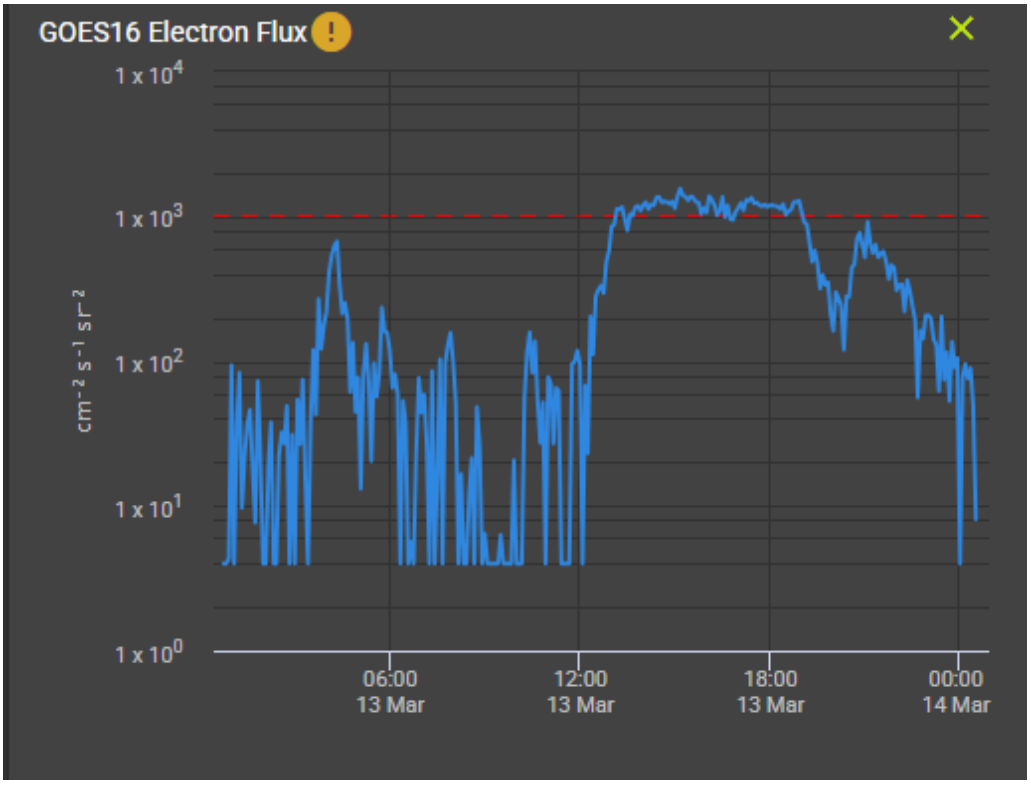
Overall the fluence is expected to see a rising trend, perhaps reaching Active (1e8 integrated pfu) by the end of day 2 (15 Mar) and more likely through day 3 (16 Mar). This is supported by the 27 day persistence, with MOSWOC REFM also showing a rising trend. Confidence then decreases day 4 (17 Mar) due to the uncertainty regarding the next HSS arrival.

GEO Electron Environment Probability (Exceedance)	Level ($cm^{-2}sr^{-1}day^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ 1×10^{8}**	No	50	60	70	50
Very Active	**≥ 2 MeV ≥ 1×10^{9}**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

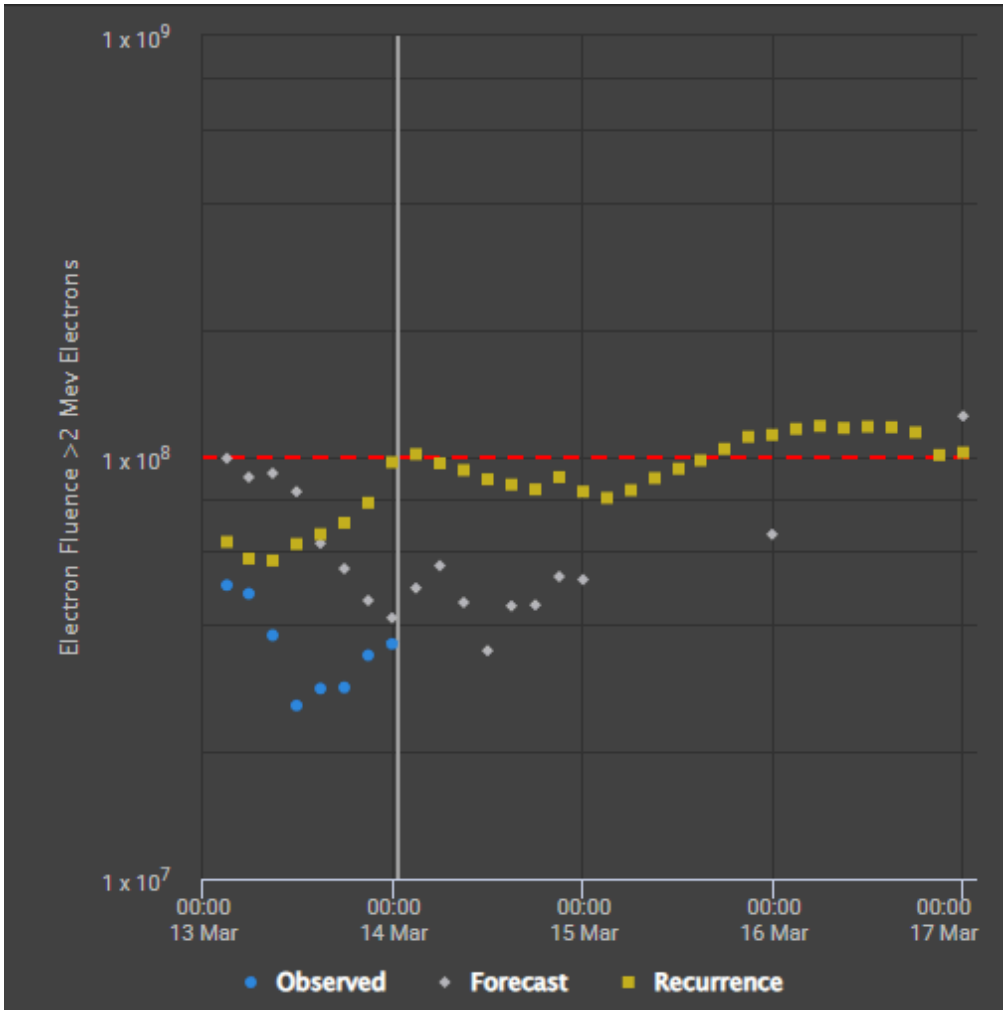
© Crown Copyright 2025. All Rights Reserved.

Figure 4: Past 24 hours of GOES 16 Electron Flux



© Crown Copyright 2025. All Rights Reserved.

Figure 5: MOSWOC REFM model.



© Crown Copyright 2025. All Rights Reserved.